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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY
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THE HEEL FLY GRUBS, OR "WOLVES", in CATTLE.

The presence of the heel fly manifests itself to the dairyman by decreased milk flow and to the cow man by stampedes and losses incident thereto which render difficult the working of cattle on warm sunny days during early spring.

Though the effects of the heel fly are well known, there are few who have actually seen the insect, and many who do not even recognize its relationship to the "wolves", or grubs which are to be found during the winter months in the backs of cattle. Even among those engaged in looking after the health of live stock and studying the various parasites which affect them there has been a great lack of exact information on this pest. The insect, with its peculiar parasitic habits, has interested scientists for many years and its great economic importance has caused the breeder of livestock to speculate considerably on its life processes and to feel an ardent desire for its destruction.

HAS COMPLICATED LIFE CYCLE.

On these subjects there has been very marked divergence of opinion among scientific workers as well as among practical breeders, and this is not surprising, considering the very complicated life cycle of the insect. The recent work of the Bureau of Entomology, and of investigators in Canada, Ireland, and Germany has cleared up very definitely most of the important questions relating to the life history and habits of the pest.

FLY DOES NOT LIVE LONG.

The span of life of the adult insect, or heel fly, is very limited. Nature has provided the grub with a generous reserve supply of food and this is utilized in the transformation from the grub to the fly, and in developing eggs within the female and producing sufficient energy for their laying. In fact, the mouth parts of the fly are not developed enough for use. Soon after the fly crawls out of the hard case, which was formerly the skin of the grub, or "wolf", it extends its wings and is ready for mating and egg laying. It is somewhat similar in shape to the common bat or nit fly of horses, to which it is related, but it is somewhat smaller and darker and flies much more rapidly. It is seldom seen except in the act of attacking cattle and even then one must have his eyes trained and be close to a gentle herd at the time the fly approaches in order to study its operations.

HOW AND WHERE EGGS ARE LAID.

The female usually alights on the ground a few feet from an animal and then flies to the heel and begins attaching the eggs to the hair below the dew-claws. It may even back up to the heel of the animal and extend

the ovipositor to reach the hairs which come close to the ground behind the heel. The animal, upon feeling the tickling of the fly, will usually kick it off but it is very persistent and usually returns at once, alighting on the lower leg and beginning again to fasten its eggs to the hairs. The persistency of the fly usually causes the animal to become more and more frightened and after about the second attack the tail is rolled over the back in the characteristic way and a dash is made for another part of the pasture or for water, or shade if available. As the animal runs, the fly often follows, depositing eggs higher up on the legs, belly or side. There is no pain attached to the egg-laying process. Frequently gentle milk cows will be approached by the fly when they are lying down and a large number of eggs will be deposited on the short hairs along the escutcheon without the animal being disturbed in the least.

The eggs are whitish and elongate and provided with a sort of clamp on the basal portion which securely fastens them to the hairs. When a fly is undisturbed it will deposit a considerable number of eggs in one place, usually from four to ten being cemented on a single hair, one above the other.

GRUBS IN BODIES OF CATTLE NINE OR TEN MONTHS.

In about four days the spiny little grubs are mature within the egg. Upon hatching they crawl down the hair and begin immediately to burrow into the skin. This is a laborious process for them and many apparently die before they get through the hide. The question of how the young gain entrance to the body of the animal has been much debated. Until recently it has been believed that the cattle, upon licking the places where the eggs are laid, either remove the eggs from the hair or the little grubs attach to the tongue and are swallowed. The very thorough experiments carried out during the last few years clearly prove that this is not the usual method of entrance. We do find, however, that the minute grubs, after passing through the skin, work upward through the tissues and finally reach the gullet. In northern Texas they are first observed in this situation in April and remain in the gullet and on the surface of some of the internal organs for five or six months. After becoming about two-thirds of an inch long they begin to work their way up to the back in the fall and winter, reaching the hide and cutting minute holes through. When they first reach the back they are quite slender and about the same length as when last observed in the gullet. They can scarcely be detected under the hide at this time, but they grow rather rapidly, enlarging the hole as they develop. In from 40 to 70 days they have changed from slender white grubs to robust dark brown or black ones. The surface of the body is well covered with sharp spines which serve the insect by producing irritation and bringing food into the pocket or cyst in which they are developing.

In northern Texas some of the grubs become full grown early in December and continue to drop out during the following three months. In southern and southwestern Texas, some of the grubs often mature earlier and these may begin to drop out in September.

It will be seen from the foregoing that the grubs are within the bodies of cattle for nine or ten months, and during this time they travel the long road from the heel to the gullet and then to the back.

WHERE THE GRUBS CHANGE TO PUPAE AND THEN TO FLIES.

The resting or pupal stage, during which the change takes place from the fleshy grub to the alert heel fly, requires from 20 to 60 days, according to temperature. This stage is passed upon the surface of the ground or under trash which is at hand when the grubs fall out. It will thus be seen that in the southern part of the United States flies may emerge and begin attacking cattle in the fall, and it is not unusual to see occasional heel fly attacks during warm periods in midwinter. In northern Texas and Oklahoma, however, the season for heel fly activity is usually from about February 20 to March 20.

METHODS OF CONTROL.

No method of destroying the heel flies themselves has been discovered and such a discovery is not likely to be made on account of the fact that the fly does not feed and is scattered widely over the cattle ranges. The egg stage is so short that it is difficult to destroy it successfully and after the young maggots have once passed through the skin they are well protected against any process of destruction until they reach the back and open a hole to the surface. It is possible during the period of development in the back, however, to effectually destroy them. Methods thus far devised for this purpose are, however, too laborious for general application under range conditions. The old method of squeezing out the grubs is fairly satisfactory for most dairy cattle in this section and the Department has found that an ointment consisting of iodoform, 1 part, and vaseline, 5 parts, thoroughly mixed and pressed into the grub holes, will destroy them without injuring the host.

The office of the Bureau of Entomology, Box 208, Dallas, Texas, is still carrying on studies relating to this pest and method of destroying it, and would be aided in this work by having reports sent in of the dates of heel fly activity in different sections of the country.

The injury of various types produced by this insect to the cattle industry of the country is so important that no breeder of dairy or beef cattle should ignore it. It has been estimated that the loss through retarded growth, reduced condition of flesh, lessened milk flow, worry, and death caused by the attack of the flies in the spring, and hide damage due to the grubs or "wolves," may reach the astounding figure of \$100,000,000 each year.

Approved:

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